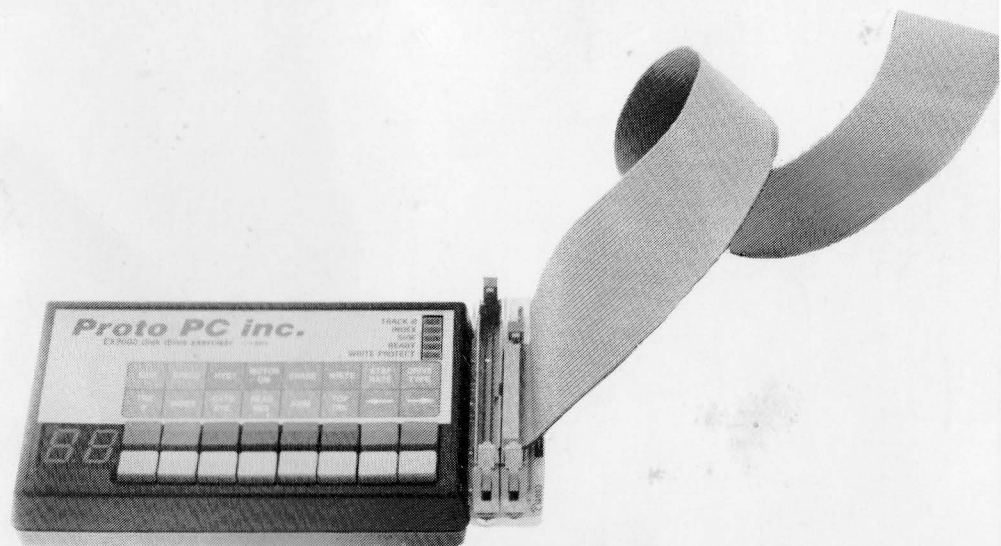


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# FLOPPY FIXER

## PROTO PC

MANUFACTURER & DISTRIBUTOR OF COMPUTER PERIPHERALS

Please take a few minutes to read and understand the cautions noted herein. The EX2000 is a high quality, conservatively designed instrument, but it is possible to damage it through improper hook-ups. See page 2 for Cautions. See back page for warranty policy.

## OVERVIEW

■ **THE EX2000:** A microprocessor based test instrument used to align and repair floppy disk drives with industry standard SA400 and SA800 interfaces. The unit is used with an oscilloscope, an alignment disk, and a service manual for the drive. The EX2000 'exerciser' is the 'stimulus' to the drive. It's capable of moving the R/W head to any track with a single keystroke, writing a track, erasing a track, measuring the rotational speed of the drive, checking for hysteresis, etc. The alignment disk provides the reference waveforms, the service manual tells you what to adjust and how to measure it, and the 'scope is the visual feedback for aligning the drive to spec.

■ **UNIQUE FEATURES:**

Single keystroke for any alignment track.  
Hysteresis check with single key.  
Speed check (instantaneous and average).  
Test points for easy scope hookup: INDEX, R DTA, MTR ON, W DATA.  
Top quality European keys, and gold connectors.  
This is the fastest, easiest to use exerciser on the market.  
The only one designed by service people, for service people.

■ **WHAT YOU'LL NEED BESIDES THE EX2000:** You'll need a power supply, power and data cables, alignment disks, service manuals, a decent scope (dual trace w/invert and add), and enough knowledge to use the above.

■ **DRIVES IT WORKS WITH:** Any floppy with standard control lines similar to the SA400 or SA800 industry standard. In other words, if the drive works in an IBM PC, Kaypro, TRS80, Xerox 820, etc., then the EX2000 will run it.

■ **THE ONLY WAY TO 'FINAL TEST' A DRIVE...** is with a computer that formats, writes, and reads actual data records, and can keep a statistical error log. The EX2000 has the capability to write a data pattern to the drive, but it's meant for exercising the electronics, not for error checking. We sell a drive performance analyzer program for IBM PC to do the final test.

■ **EX2000 OWNERS INCLUDE:** NASA, FAA, Xerox, Indeserv, Computerland, RCS, CBS, ABC, IBM, Army, Navy and hundreds of computer dealers, universities and individuals.

■ **WE ALSO SELL:**

Service Manuals  
Parts  
Floppy and Hard Disk Drives  
Memory

## SET-UP

■ **YOU MUST:** Use the SAME supply to power both the drive under test and the EX2000!!! Be careful about hooking up power. Make SURE that the +5 volts and ground are properly connected. The 'Y' power cables will give you the proper hookup with a minimum of hassle, if your drives use standard connectors, e.g. SA400, SA800, TM100, IBM PC, TRS80, etc. Be careful hooking up the drive data cable. Make sure the pin 1's are oriented properly.

■ **CONNECTING POWER:** Using Proto PC Inc. 'Y' cables...

Plug the cable from the power supply into the junction of the 'Y' power cable. Plug one end of the 'Y' power cable into the drive, and the other end into the EX2000. The 5" drive 'Y' cable connects all four wires (+5, two grounds, and +12,) and the 8" drive 'Y' cable connects +5 and ground only. Make sure the jumpers on the right side of the EX2000 are set right. See next page (Jumpers').

■ **CONNECTING DRIVE:** Next, attach the data cable from the EX2000 to the drive. MAKE SURE you get the connector on the right way. Pin 1 on the EX2000 (marked on PC board next to copyright) MUST go to pin 1 on the drive. See illustration on next page.

■ **OTHER SETUPS:** The exerciser requires +5 volts at .4 amps. There is a standard 5" floppy power connector on the right side for this connection. Use an AMP part #1-480424-0 shell, with AMP 60617-1 contacts, and fuse the power lines (1.5 A fuses.) We can provide connectors. Make SURE you connect +5 to pin 4, and ground to pin 3. See page 3 for illustration. You may also connect +12 to pin 1, and another ground to pin 2, although these aren't required.

## JUMPERS

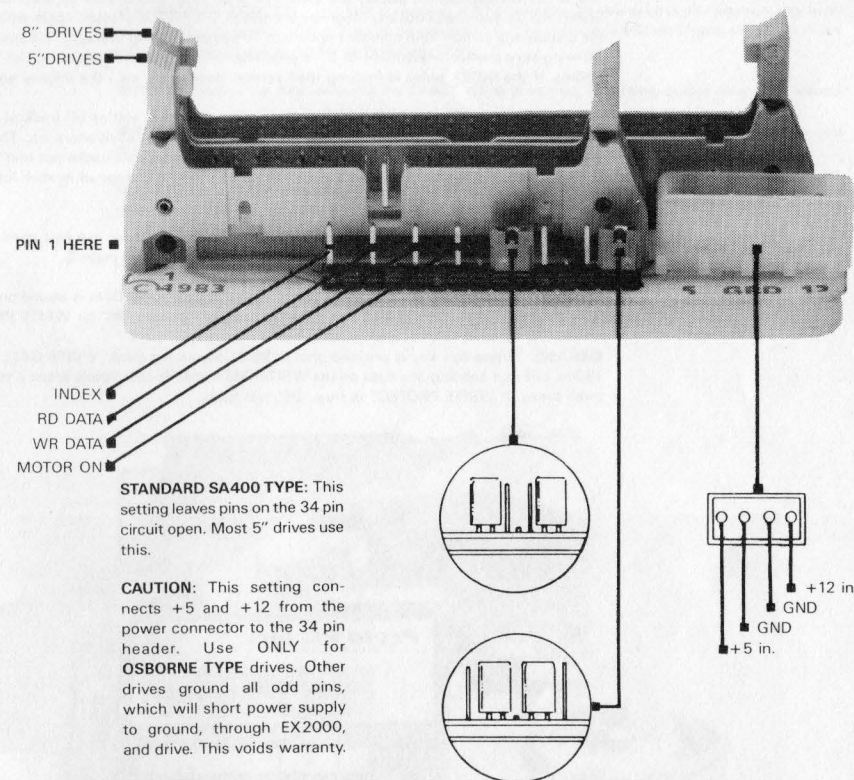
■ **THE EXERCISER** as shipped has all odd pins on the 34 pin header (5" drives) grounded or jumpered OPEN. It's possible, using the two mini-jumpers, to connect +5 from the AMP connector to pins 21/23/25/27, and +12 to pins 11/13/15/17 on the 34 pin header for 'osborne' type 5" drives, which get power from the data cable instead of using a separate power connector. However...

CAUTION — DANGER — BEWARE !!!

All normal 5" drives tie these lines to ground, so if you jumper the EX2000 for 'osborne' drives (power through the data cable,) and connect it to a normal drive, you'll SHORT CIRCUIT THE SUPPLIES to ground, through the drive, data cable, and EX2000.

BE CAREFUL !!!

Check the jumpers before you hook up a drive; be sure they're set for the type of drive you're working on. Jumpers are spread apart (2 pins showing between jumpers) for normal operation. Jumpers next to each other for 'osborne.' See picture below.





## KEYBOARD LAYOUT

There are three kinds of keys: FUNCTION, SELECT and HEAD MOVE. The Function keys execute a function, the Select keys select an operating mode, and the Head Move keys issue step pulses to move the head. Six Head Move keys select preprogrammed track numbers from a track table, and two 'Jog' keys let you step or slew to any track.

## FUNCTION KEYS

■ **SIDE:** Pressing the SIDE key toggles the SIDE output line, and shows the current side on the display for 1 second.

■ **SPEED:** This function measures the time between INDEX pulses and displays it in milliseconds. The 'tens' and 'ones' digits are shown. When the value approaches 200ms, (199ms or 201ms, '99' or '01' on display,) the display will switch to 'ones' and 'tenths' ('90' or '09,') for fine adjustment. Speed will be displayed until any other key is pressed. If SPEED is pressed again while in SPEED mode, the display will switch from constant update to 16 sample running average. This smooths the reading, allowing very precise adjustment of 5" drives. Normal reading on 8" drives will be 65-67, indicating 166ms. If the INDEX pulse is missing (bad sensor, door open, etc.) the display will flash '88'.

■ **HYST:** 'Hysteresis' is a mechanical problem where the head settles off track at the end of a step sequence. It's usually caused by sticky rails, loose or kinked band positioners, etc. The HYST key steps the head 10 tracks in, then back. The next press of HYST steps 10 tracks out and back. When used with a scope and the CATSEYE track on an alignment disk, a change of relative lobe heights clearly shows hysteresis.

■ **MOTOR ON:** This key toggles the MOTOR ON output line. There is a test point on the right side of the EX2000, to monitor this line on the scope. See picture on page 3.

■ **WRITE:** This key writes a track for 150ms with a square wave. Data is issued on the WRITE DATA line while WRITE GATE is pulled true. Error messages: Flashing '99' for WRITE PROTECT.

■ **ERASE:** When this key is pressed, the EX2000 erases the track. WRITE GATE is pulled true for 150ms without sending any data on the WRITE DATA line. To completely erase a track, press two or three times. If WRITE PROTECT is true, '99' will flash.

## SELECT KEYS

■ **STEP RATE:** When pressed, shows the current STEP RATE on the display for one second, then display switches back to TRACK #. If pressed again within that one second, display will advance to the next choice. Choices are 3-30ms in 3ms steps; default is 9ms.

■ **DRIVE TYPE:** This key works like STEP RATE, but changes the track tables for the Head Move keys. These program the bottom row of keys to the track numbers on the alignment disk for a particular type drive. '51' = 5" 48tpi, '52' = 5" 96tpi, '53' = 5" 100tpi, '81' = 8" 48tpi. The '51' setting uses Dysan 224/1A or /2A (DS) alignment disks, '52' and '53' work with the 206-30, and '81' works with 360/A or 360/2A 8" disks. CAUTION: If DRIVE TYPE is set wrong, the head may run into the spindle.

## HEAD MOVE KEYS

■ **ALIGNMENT TRACKS:** The first six keys in the bottom row let you access all common alignment tracks with a single keystroke. They're programmed for the industry standard Dysan alignment disks. We can supply these disks for virtually any drive.

■ **TRK 0:** Moves the head out until the TRACK 0 line goes true, or 99 step pulses have been issued.

■ **INDEX, CATSEYE, READ RES, AZIM, TOP TRK:** Move the head to the proper track number to view these alignment waveforms.

■ **JOG KEYS:** These keys will move the head in and out one track per press, or slew the head if held down more than .5 seconds.



## USING THE EX2000

■ **NOTE:** We suggest starting with a 'known good' drive to familiarize yourself with the EX2000.

■ **CAUTION:** It's a good idea to use a scratch disk first, and verify that the R/W circuitry works properly BEFORE using an alignment disk. If the drive is stuck in write mode, the \$75 alignment disk will be ruined.

- 1 ■ Hook up the power and data cables, making sure to connect power properly and get the pin 1's on the data cable right.
- 2 ■ Hook up the scope to the read amp test points on the drive, and set the controls. A service manual for the drive you're working on will describe this procedure in detail. We can provide service info and parts for most drives.
- 3 ■ Connect the EXT TRIGGER of the scope to the INDEX test point on the right side of the EX2000 (see page 3 for test point locations.) This will sync the scope to the rotation and give a stable display.
- 4 ■ Insert a scratch disk in the drive and turn on the power supply. The head on the drive should move to TRACK 0, and the EX2000 display should light up with '00'.  
 NOTE: Some power supplies (IBM PC, etc.) have a very slow rise time, and the EX2000 may not reset properly. If the display doesn't light up, try connecting the power cable to the EX2000 after turning on the supply.
- 5 ■ Set the DRIVE TYPE for the kind of drive you're working on. See the description of DRIVE TYPE for details.
- 6 ■ Press the MOTOR ON key. On 5" drives this will start the motor. On 8" drives, this activates the HEAD LOAD line. At this point there should be an INDEX pulse 5 or 6 times a second, and you can adjust the scope for solid triggering.
- 7 ■ Press the WRITE key. A band should appear on the scope screen. If you don't get the band, or if it just flashes on the screen, the drive may be stuck in write mode. If this is the case, repair the drive before continuing.
- 8 ■ Press the ERASE key. Most of the band should disappear. Pressing the ERASE key several times erases the entire track.
- 9 ■ Now that the R/W circuit has been verified, the alignment disk can be used to align the drive. Pull the scratch disk and insert the proper alignment disk. You should see the band on the screen again, since you're still on track 0.
- 10 ■ Press the CATSEYE button. The head will move to the proper track, and the two lobes will appear on the screen. If the two lobes are of equal height, the drive is in proper radial alignment. The service manual will tell you how unequal the lobe heights can be without violating spec. Generally, if the smaller lobe is within 90% of the larger one, the alignment is OK.
- 11 ■ Press the HYST key; wait a second and press it again. Did the relative heights of the lobes change? If so the drive mechanism is faulty. A little hysteresis (6 - 7 %) won't hurt, but a large amount will cause read errors.

**NOTE:** Most drives have adjustments for Radial Alignment, Index Timing, Track 0 Position, and Compliance (load pad pressure and position.) Azimuth problems are usually caused by a poorly machined frame, and most drives don't have an Azimuth adjust. The alignment disks have a track for each adjustment. See the alignment disk and drive manuals to get detailed instructions.

## APPENDIX

## Active Input/Output lines, and termination specs.

■ **POWER SPECIFICATIONS:** The EX2000 uses +5 volts only, at a draw of .4 amps max. A +12 volt connection is provided for 'osborne' type drives, but it is not required for normal operation of the EX2000. See picture on page 3 for pin connections. Also marked on board by the connector.

■ **OUTPUTS:** Are 7406 open collector TTL, with 1K to +5 except SIDE, which is pulled to +5 through 150 ohms and an LED.

■ **INPUTS:** Are 74LS14 TTL inputs with 1K to +5, except TK00, INDEX READY, and WR PROTECT, which have 150 ohms and LED to +5.

## DATA CABLE PINOUTS

SIGNAL NAME	34 PIN	50 PIN	NOTES
Drive Section 1, 2, 3	10/12/18	26/28/30	Tied To Ground
Motor ON/Head Load	16	18	Output from EX2000
Side	32	14	Output from EX2000
Step	20	36	Output from EX2000
Direction	18	34	Output from EX2000
Write Gate	24	40	Output from EX2000
Write Data	22	38	Output from EX2000
Index	08	20	Input to EX2000
Track 00	26	42	Input to EX2000
Write Protect	28	44	Input to EX2000
Ready	NC	22	Input to EX2000

■ **INDEX, RD DATA, WR DATA, MOTOR ON** connect to test points on end. All other even numbered pins left open circuit on headers.

■ **8" DATA CONNECTOR GROUNDING:** All odd numbered pins on the 50 pin header are tied to ground.

■ **5" DATA CONNECTOR GROUNDING:**

Pins 1, 3, 5, 7, 9, 19, 27, 29, 31 and 33 on 34 pin header are tied to ground.

Pins 11, 13, 15, and 17 can be jumpered OPEN or to +12. Open as shipped from factory — use CAUTION.

Pins 21, 23, 25 and 27 can be jumpered OPEN or to +5. Open as shipped from factory — use CAUTION.



## NEW PRODUCTS WARRANTY

■ **MONEY BACK GUARANTEE:** If you are not satisfied with the product you purchase through Proto P.C. of St. Paul, MN for any reason, you may return it to us *undamaged* within thirty (30) days from date of shipment for a refund of the product purchase price, exclusive of shipping (refund will be mailed within seven (7) days.)

■ **ONE YEAR WARRANTY:** Proto P.C. of St. Paul, MN warrants that all new products purchased through us shall be free of defects in material and workmanship. This Warranty is good for a period of twelve (12) months from date of shipment on all products. Please report any defects promptly, and Proto P.C. will repair or replace (with same or equivalent product) your purchase in thirty (30) days or less from the date we receive it under warranty.

■ **CALL FOR RETURN AUTHORIZATION:** Before we will accept any returns for repair or replacement we require that you call us and obtain a Return Merchandise Authorization Number. You are responsible for returning product to Proto P.C. freight prepaid and at your own risk; Proto P.C. will be responsible for returning product to you via UPS ground-rate prepaid (in the continental U.S.) No replacement, or refund will be made prior to receipt of originally purchased product.

■ **YOU ARE RESPONSIBLE FOR SAFE RETURN SHIPMENT:** All products returned to Proto P.C. under Warranty **MUST** be properly packed to protect them during shipment, or no repair, replacement, or refund will be given. Return shipment in original container is highly recommended. If this is not possible, then we advise that you call us for packaging recommendations. If product is not properly packed we reserve the right to void Warranty.

■ **PROOF OF PURCHASE:** You must produce a copy of the purchase invoice as proof of your purchase to receive repair, replacement, or refund under Warranty. This is the responsibility solely of the purchaser. If product is serialized, then the serial number on the product must agree with the serial number on the invoice copy or no repair, replacement, or refund under Warranty will be honored.

■ **TO PROTECT YOUR WARRANTY:** This Warranty is void if product has been subjected to improper installation, misuse, accident, neglect, or repair by purchaser or any third party. Certain sales are excluded from this Warranty. For such sales your invoice will be stamped 'Separate Warranty Applies.' This Warranty sets forth all of your warranty rights. Proto P.C. will not be responsible for any consequential damages arising from the purchase of its products.